



Emergency and Disaster Management Preparedness at RS X Kendari based on Hospital Safety Index

Syawal Kamiluddin Saptaputra*¹, Sita Ivayanti Indriani², and
Ramadhan Tosepu² 

¹ Occupational Health and Safety Department, Public Health Faculty, Halu Oleo University, Indonesia

² Master of Public Health Study Program, Public Health Faculty, Halu Oleo University, Indonesia
syawalkesker2012@gmail.com

Abstract. Emergency conditions that occur in hospitals include safety and security emergencies, spills of materials and waste of hazardous and toxic materials (B3), failure of medical and non-medical equipment, hospital utility emergencies, and outbreaks/outbreaks/pandemic diseases. Types of disasters that can have an impact on hospital readiness include geophysical, meteorological and hydrological disasters. Climatology, Biology, and Extraterrestrial. The aim of the study was to find out the description of emergency and disaster management preparedness at Hospital X Kendari in dealing with disasters based on the hospital safety index. This research is included in the mixed methods research with the type of Sequential Explanatory Design. Retrieval of quantitative data in the form of preparedness status of Hospital X Kendari using the Hospital Safety Index (HSI) checklist table from PAHO/WHO. In the second stage, qualitative data collection and analysis was carried out in the form of in-depth interviews, observation, and document review. Informants in this study included the Chair of the Hospital K3 Committee, Public Relations, HR, Facilities and Infrastructure, Logistics and Finance, Nursing and Medical Services. The results of this study indicate that the Index Group Score for Management and coordination is 0.375; Hospital disaster management planning is 0.5; Communication and information management is 0.37; Human resources is 0.3; Logistics and finance is 0.37; Patient services and support services is 0.39; Evacuation, decontamination and security systems. The total Emergency and Disaster Management Preparedness index is 0.39 so that RS X is in classification B (Moderate).

Keywords: Preparedness, Management, Emergency, Disaster, Hospital Safety Index.

1 Introduction

According to BNPB Sultra (2021) the Southeast Sulawesi Province region has experienced 448 disaster events in the last 20 years [1]. Each disaster has an impact in the form of loss of life as well as loss and damage. The type of disaster with the highest

number of incidents and with the greatest impact is flood, both in terms of its impact on human life safety, damage to residential buildings and land damage. Overall from these disasters, the percentage of the number of disaster events in Southeast Sulawesi Province in 1999-2019 is as follows: Floods (49.78%), extreme weather (29.02%), extreme waves and abrasion (3.13%) earthquakes earth (1.56%), forest and land fires (1.34%), drought (5.13%) and landslides (10.04%)

Health service facilities play an important role in efforts to reduce/minimize the number of victims during a disaster and speed up the post-disaster recovery process. Legislation regarding disaster-safe health facilities already exists. However, several studies show that health facilities in Indonesia are still not safe against disasters. Safe health facilities have not yet become a key component in the program for national disaster management, there has been no confirmation of which sectors are involved and hospital accreditation does not make the requirements for safe hospitals a determinant of graduation [2]. The Hospital Safety Index (HSI) is a tool designed for assessing the safety of tertiary hospitals, university hospitals or primary referral hospitals because hospitals have the most important role in responding to emergencies and disasters. Serves as a diagnostic tool to assess the likelihood that hospitals will remain operational in emergencies and disasters [3]. Hospital X Kendari has several potential internal and external dangers. External hazards can disrupt and paralyze services at Hospital Internal dangers, apart from infectious diseases, there are also other potential dangers that can be influenced by the situation and conditions in the hospital, namely explosions, fires, accidents related to electrical installations, radiation, dangerous chemicals, anesthetic gas, psychosocial disorders and ergonomics. All of these potential dangers can cause disasters in hospitals that threaten the lives and lives of employees, patients and visitors in the hospital environment.

Currently, one of the hospital accreditation assessments using the National Hospital Accreditation Standards (SNARS) January 1 2018 Edition, is in Health Facility Management (MFK) No. 6, namely the Hospital carries out a self-assessment regarding disaster and emergency management using the Hospital Safety Index (HSI) instrument. Emergency conditions that occur in hospitals include safety and security emergencies, spills of hazardous and toxic materials and waste (B3), medical and non-medical equipment failures, hospital utility emergencies, and disease outbreaks/outbreaks/pandemics. Types of disasters that can impact hospital readiness include geophysical, meteorological and hydrological disasters. Climatology, Biology, and Extraterrestrials [4]. Hospital preparedness at a low level of preparedness indicates that immediate corrective action is needed. Hospital preparedness status is inadequate to protect patients and hospital staff during and after a disaster [5]. The aim of the research is to determine the description of the emergency and disaster management preparedness of Hospital X Kendari in dealing with disasters based on the hospital safety index.

Thus, hospital preparedness is needed in terms of structural, non-structural and emergency and disaster management so that we can know how to prepare the hospital before, during and after a disaster, and can be used as a reference for self-assessment for Hospital X Kendari in carrying out monitoring.

2 Methods

This research was conducted at Hospital X Kendari in Southeast Sulawesi Province. The research was conducted from June to July 2023. This research is included in mixed methods research with the Sequential Explanatory Design type. Quantitative data was collected in the form of the preparedness status of RSUD Aliyah Kendari using the Hospital Safety Index (HSI) checklist table from PAHO/WHO. In the second stage, qualitative data was collected and analyzed in the form of hospital obstacles in implementing disaster preparedness.

This method is used to strengthen the results of quantitative research carried out in the first stage. The combination of the two data connects the results of the first stage of research with the next stage. Quantitative methods play a role in obtaining measurable data which can be descriptive, comparative and associative. Meanwhile, qualitative methods play a role in proving, deepening, weakening or disproving the quantitative research data carried out in the first stage. Quantitative methods are used to determine the status of hospital preparedness in facing disasters where the measurement results are in the form of descriptive data, while qualitative methods are used to determine the obstacles experienced by hospitals in implementing disaster preparedness.

In this research, informants were determined using a purposive technique, that is, they were selected with certain considerations and objectives, who really mastered the object under study. These particular considerations include, for example, the person who is considered to know best about what is expected, or perhaps he or she is the authority, making it easier for the researcher to explore the object/social situation being studied. Through this retrieval technique, researchers are able to provide in-depth studies, because the data sources are obtained from people who are directly or indirectly in the organizational structure of the hospital's disaster management team.

The informants in this research include the Occupational Health and Safety Chair of the Hospital Committee, Public Relations, Human Resources, Facilities and Infrastructure, Logistics and Finance, Nursing and Medical Services. Primary data was obtained from a questionnaire based on the WHO Hospital Safety Index which was distributed to the entire sample. Secondary data is complementary data to the primary data collected. Secondary data was obtained from each hospital, organizational structure, policies, number of medical and non-medical personnel and SOP as well as other information related to research.

3 Results

3.1 Quantitative data analysis

3.1.1 Hospital Structural Preparedness

The assessment of hospital structural preparedness indicators consists of the safety of the hospital building and the weight of the hospital building. The results of the structural preparedness assessment can be seen in Table 1.

Table 1. Recapitulation of Structural Preparedness of Hospital X Kendari

No	Index group	Score	The maximum number of item values	Index Group Score
1	Hospital Building Safety	1,5	3	0,5
2	Weight of hospital building	9	15	0,6
Structural Preparedness Index		10,5	18	10,5/ 18 = 0,583

Classification of structural preparedness index scores (WHO 2015)

A = 0,66 - 1

B = 0,36 - 0,65

C = 0 - 0,35.

The results show that the hospital building safety index group is an index group with a medium level of preparedness (classification B).

3.1.2 Hospital Non-Structural Preparedness

The assessment of non-structural preparedness consists of 4 index groups, the first of which is architectural elements, which consists of 15 statements. The two infrastructure protection, access and physical safety consist of 4 statements. The three critical systems consist of 53 statements. The four equipment and supplies consist of 21 statements.

The results of the assessment of the hospital's non-structural preparedness can be seen in Table 2.

Table 2. Recapitulation of Non-structural Preparedness for Hospital X Kendari 2023

No	Index group	Total score	The maximum number of item values	Index Group Score
1	Architectural elements	10,5	15	0,7
2	Infrastructure, access and physical protection safety	2,5	4	0,625
3.	Critical systems	22	53	0,415
4.	Equipment and supplies in the hospital	6	21	0,286
Non-Structural Preparedness Index		41	90	41/90 = 0,45

Classification of nonstructural preparedness index scores [3].

A = 0.66 - 1

B = 0.36 - 0.65

C = 0 - 0.35.

The results show that all non-structural preparedness index groups are at a medium preparedness level (Classification B)

Critical systems are part of non-structural preparedness elements consisting of electrical systems, telecommunications systems, water supply systems, fire protection systems, waste management systems, fuel storage systems, medical gas systems, and heating, ventilation and air conditioning (HVAC) systems. The critical system has an index of 0.415 with a total of 53 items, namely 8 items in the low category (0), 38 items in the medium category (19) and 3 items in the high category (3). Each assessment of the critical system elements can be seen in Table 3.

Table 3. Critical System of Hospital X Kendari

No	Critical system elements	Number of detailed assessment points			The maximum number of item values	Index
		Low	Medium	High		
1	Electricity system	1	7	2	10	0,55
2	Telecommunication Systems	1	7	-	8	0,44
3	Water Supply System	1	5	-	6	0,42
4	Fire Protection System	1	4	-	5	0,4
5	Waste Management System	-	5	-	5	0,5
6	Fuel Storage System	0	-	-	5	0
7	Medical Gas system	1	4	1	6	0,5
8	Heating, Ventilation and Air Conditioning (HVAC) Systems	2	6	-	8	0,38
Index Group Score		0	38	3	53	22/53 =0,415

- Low = 0
- Medium = 0,5
- High = 1

In Table 3 it can be seen that the 8 critical system assessment elements are at a medium preparedness level. In Hospital fuel storage systems the level of preparedness is low because it does not have a fuel storage that meets the standard, because it is only stored in the drum for the supply of generator machines.

Based on the total number of scores obtained from the four index groups, non-structural preparedness has an index of 0.45, which means that Hospital X Kendari is at a medium preparedness level with classification B.

3.1.3 Emergency and Disaster Management Preparedness

The assessment of hospital emergency and disaster management preparedness consists of 7 elements. The first is management and coordination which consists of 8 statement items. The second is hospital disaster management planning which consists of 5 statement items. The third is information and communication management with 4 statement items. Fourth is human resources with 5 statement items. The fifth is logistics and finance with 4 statement items. The sixth is patient and support services with 9 statement items. The seventh is evacuation, decontamination and security systems, with 5 statement items. Coordination of disaster and emergency management activities

The results of the assessment of hospital emergency and disaster management preparedness can be seen in Table 4.

Table 4. Recapitulation of Emergency and Disaster Management Preparedness at X Kendari Hospital

No	Index Group	Total score	Number of statements	Index Group Score
1	Management and coordination	3	8	0,375
2	Hospital disaster management planning	2,5	5	0,5
3	Communication and information management	1,5	4	0,37
4	Human Resources	1,5	5	0,3
5	Logistics and finance	1,5	4	0,37
6	Patient care and support services	3,5	9	0,39
7	Evacuation, decontamination and security systems	2	5	0,4
Emergency and Disaster Management Preparedness		15,5	40	15,5/40 = 0,39

Classification of emergency and disaster management preparedness index scores (WHO, 2015):

A = 0,66 - 1

B = 0,36 - 0,65

C = 0 - 0,35

Based on the results of the checklist table, all emergency and disaster management preparedness index groups have a medium level of preparedness (Calcification B).

3.1.4 Hospital Readiness Status X Kendari

The preparedness status of Hospital After accumulating the results of each disaster preparedness indicator into the preparedness weight in module 2 of the Hospital Safety Index (HSI), the preparedness status of Hospital X Kendari can be seen in Table 5.

Table 5. X Hospital Kendari Preparedness Index

No	Elements of preparedness	Preparedness score	The weight of preparedness	Results
1	Structural Preparedness	0,58	33,3%	0,19
2	Nonstructural Preparedness	0,45	33,3%	0,15
3	Emergency and disaster management preparedness	0,39	33,3%	0,13
Hospital Preparedness Index				0,47

Hospital Corrective action is required in the short term. The preparedness status is quite adequate, but the function of the hospital still has the potential to fail when a disaster occurs.

3.2 Qualitative data analysis

3.2.1 Hospital Structural Preparedness

Based on the results of in-depth interviews, it shows that the obstacles for RSU Aliyah 2 Kendari in implementing structural preparedness are caused by budget funds and land problems.

3.2.2 Hospital Non-Structural Preparedness

The results of the analysis from in-depth interviews show that the obstacles in implementing non-structural preparedness at RSU Aliyah 2 Kendari are generally constrained by budget problems, limited land.

3.2.3 Emergency and Disaster Management Preparedness

The results of in-depth interviews show that the lack of fire drills and budget funds are the main obstacles in implementing emergency and disaster preparedness at Hospital X Kendari. Apart from that, the obstacle found was the unavailability of a budget for routine emergency training so that hospital employees did not understand disaster preparedness.

4 Discussion

4.1 Disaster Preparedness Analysis of Hospital Structural Elements

The hospital building safety index is at a medium level, classification B with an index score of 0.5, which means that preparedness is adequate but the hospital building still has the potential to suffer damage when a disaster occurs. RSU Aliyah 2 was established in 2016 but was renovated in 2018, namely expanding the ER building to 5 TTs, which previously had 2 TTs. Increasing the Outpatient Poly room to 2 floors as well as adding HCU and perinatology rooms. Meanwhile, in 2024 construction will begin on the hospital inpatient building. Because the previous area was a fish pond area, now while the land is being filled,

Hospitals have an important role in health service infrastructure. When a disaster occurs, apart from having the main responsibility for life safety, the hospital also provides emergency services 24 hours and 7 days a week [2]. The safety structure of a hospital building is the ability of the building structure to withstand hazardous events which include building location, materials and design. Poor structural design means that damage from hazards to hospital structures can lead to building failure and collapse. Moderate structural design provides partial protection and will cover situations where the effects of a hazard may cause damage but this damage is not expected to cause collapse of the building. A good rating indicates that the building will not collapse when exposed to danger. Therefore, the efforts being made by the Aliyah 2 General Hospital currently are to add buildings in the western area of the Aliyah 2 General Hospital Kendari, so that repairs can be carried out in the old inpatient building of the Aliyah 2 Kendari General Hospital.

Based on observations made by researchers, there are indeed several hospital buildings that have small cracks and paint damage on the walls, for example in the sterilization room. This is because the building is quite old, but several repairs have been carried out by repainting. In order to improve the quality of the hospital building structure, currently the Aliyah 2 Kendari general hospital is also expanding the land to add a new building. However, because the land is a former pond, the landfill process is currently in progress. Hopefully by the end of 2023 the construction of the new inpatient building can be completed. The structural system and the quality and quantity of construction materials provide the building's stability and resistance to natural forces. Managers make adjustments in building structures for different hazards that may affect hospitals, as structural solutions may apply to one hazard but not another (e.g. for earthquakes but not hurricanes or floods) [3]. Structural strengthening in hospitals is very important, in accordance with research results that structural resistance is very important during disasters [2]. The process of strengthening the structure requires a fairly large budget. It is necessary to consider budget submission constraints and technical capacity, while the same needs to be strengthened in non-structural elements and emergency and disaster management.

4.2 Disaster Preparedness Analysis from Non-Structural elements

Non-structural elements are disaster preparedness elements with a medium level of preparedness, namely 0.48. The widening and construction of the inpatient building is being carried out, although it is only at the filling stage. The renovation and construction of a new building at RSU Aliyah 2 continues to prioritize safety conditions for movement outside the hospital building, namely by not disturbing pedestrian and vehicle access to the hospital, by passing through other points at the hospital entrance. Hospital preparedness for disasters in terms of non-structural equipment, especially earthquakes and strong winds, is very important, especially in developing countries. Implementing risk management in hospitals can increase hospital preparedness in facing earthquake disasters. This requires a national strategy and planning for all health facilities. To develop disaster preparedness programs, disaster management in hospital assessment and accreditation can encourage hospitals to invest in disaster mitigation and preparedness.

Access is critical if hospitals are to function well. The access that is being assessed is the main route to the hospital. The route to the hospital must be effective in terms of safety and protection, namely in terms of vehicle and pedestrian access. Internal water supply systems in hospitals are usually divided into two types of use: namely facility uses such as air conditioning systems, boilers, autoclaves, medical equipment, fire extinguishing and sprinkler systems, and staff or patient uses such as dietetics, dialysis services, laboratories, patient decontamination, pharmacy, surgery and toilets [6].

Hospitals are considered very difficult buildings to evacuate. Therefore, the most important aspect of fire disaster safety is having good means of prevention and protection. Early detection is an important line of defense against hospital fires. Fire alarm systems can be operated manually and automatically. The alarm, detection and extinguishing system must be connected to an automated fire extinguishing system [7]. The telecommunications system referred to in this research is reviewing the condition and safety of antennas, telecommunications equipment and cables used in hospitals. The telecommunications system index at RSU Aliyah 2 Kendari is at a medium alert level of classification B, this can be seen from the index score of 0.5. This is supported by telecommunications equipment in the form of telephones which every hospital employee has. A special telecommunication system in the form of an Airphone (internal hospital telephone) between wards and a loudspeaker connected to all rooms is also used in the hospital, as well as its own cellphone specifically for each room if necessary to send pictures and reports via the WhatsApp group. The Airphone itself has a weakness that if the light goes out it cannot be used, to reduce the electricity usage capacity when using a generator, the Hand Phone unit can be used for communication. Because a communication system is needed that can be used if the normal system fails or is overloaded [8].

A safe and suitable place must be designed to store fuel. Tanks must be protected, must not be damaged, and must remain available in times of crisis. Another important point in the fuel storage system is to check the fuel transfer pipes and fittings periodically. Damage to the fuel transfer system during a disaster can result in an explosion, which can cause destruction of the hospital [6], but Hospital X does not yet have this.

4.3 Disaster Preparedness Analysis from Disaster Management elements

The health care system has an important role in providing health services during disasters. Hospitals are expected to be prepared to maintain a safe environment for patients and staff, continue hospital operations effectively, and adequately provide for the medical needs of victims in disaster areas. Disaster management plans are critical in ensuring hospital emergency preparedness and response. A disaster management plan is a series of procedures, policies, interaction patterns, roles and contingencies that must be implemented in the case of an event in accordance with predetermined criteria. A reliable disaster plan functions as a system for managing responses to disasters and is the basis for effective acute medical responses [2].

Assessment of hospital preparedness in emergencies and disasters is important to explain weaknesses in hospital disaster management planning and ensure effective hospital functioning. Hospital X Kendari must take long-term prevention to improve

hospital safety starting before, during and after a disaster. Some of the challenges that will be faced by each hospital's disaster committee/team include, lack of preparation such as no previous staff training and lack of training programs; lack of planning appropriate to disaster situations; failing to anticipate and discover needs; and lack of attention to experiences and lessons from previous disasters.

Logistical challenges such as inappropriate premises for providing services to injured people; donation management; do not have special disaster finances; security management; and human resource management. The Emergency Unit at X Kendari Hospital, which consists of 5 beds, is at risk of running out of space when a disaster occurs to handle injured patients. Lack of coordination such as coordination problems with volunteers who want to help; lack of coordination among hospital staff; lack of coordination among officials at different hospitals; lack of coordination between pre-hospital emergency and hospital officials; unavailability of an incident command system or available, but not operational; staff disobey superiors' orders; poor performance of staff duties; lack of unity of command; fragmentation and repetition; and inappropriate intervention by unrelated individuals. The situation at RSU Aliyah was improved by using group telecommunications media to prevent miscommunication. Communication and information management such as contact with the media; communication within the hospital; out-of-hospital communication; and management of people and visitors is very important. Public hospitals need to improve capabilities in the planning components of hospital response and recovery from disasters as well as logistics and financial components. All hospitals need to improve their capabilities in patient care components and supporting services, especially in the sub-components of expanding rooms for victims, for example and psychosocial services as well as providing special budgets during disasters. Disaster management at Kendari Center (EOC), cooperative planning and coordination mechanisms with local disaster management agencies, and cooperative planning and coordination mechanisms with health service networks.

Researchers found that the hospital had updated its external stakeholder contact information, this contact was last updated more than three months ago and the hospital already had procedures for communicating with the public and the media as well as special spokespersons for delivering news. Hospital staff contacts are available; some have never been updated. The hospital also has patient information management procedures, namely that in each work shift there is staff whose job is to save patient documents in the event of a disaster. This is one of the challenges for disaster management coordinators [9]. The evacuation process requires quite a lot of human resources and quite a long time, but it must be done quickly and safely. There are two types of evacuation.

5 Conclusion

The preparedness of RSU Aliyah 2 Kendari in facing disasters is at a medium level of preparedness and classification B with an index score of 0.47. which means

corrective action is needed in the short term. The preparedness status is quite adequate, but the function of hospitals still has the potential to fail in responding to disasters.

References

1. BNPB. BNPB Verifikasi 5.402 Kejadian Bencana Sepanjang Tahun 2021. Jakarta; 2022.
2. Suparni. Analisis Kesiagapan Rumah Sakit dalam Menghadapi Bencana. Depok: Universitas Indonesia, Fakultas Kesehatan Masyarakat; 2019.
3. World Health Organization. Hospital safety index: guide for evaluators. 2nd edn. Geneva: WHO Library-Cataloguing-in-Publication Data; 2015. Available from: https://www.who.int/hac/techguidance/hospital_safety_index_evaluators.pdf.
4. Guha-Sapir D, Hoyois P, Below R. Annual Disaster Statistical Review 2013. Available from: <https://www.alnap.org/help-library/annual-disaster-statistical-review-2013>; 2013.
5. Wijaya. Analisis Kesiapsiagaan Rumah Sakit Di Kota Padang Untuk Mengantisipasi Ancaman Gempa Bumi dan Tsunami. JPKMI (Jurnal Publikasi Kesehatan Masyarakat Indonesia); 2017.
6. Yenni RA. Analisis Kesiapsiagaan Rumah Sakit dalam Menghadapi Bencana Berdasarkan Hospital Safety Index di RSUP Dr. Mohammad Hoesin Palembang Tahun 2020. Universitas Sriwijaya; 2020.
7. Kemenkes RI. Petunjuk Teknis Kesiapsiagaan Kondisi Darurat Dan/atau bencana di RS. Jakarta; 2020.
8. Paripurno ET, Jannah NM. Panduan Pengelolaan Risiko Bencana Berbasis Komunitas (PRBBK). 2nd edn. Edited by T. Wuryantari. Sleman: Masyarakat Penanggulangan Bencana Indonesia; 2018.
9. Nia SPS, Kulatunga U. Safety and security of hospitals during natural disasters: Challenges of disaster managers. *Int J Saf Secur Eng*. 2017;7(2):234-246. <https://doi.org/10.2495/SAFE-V7-N2-234-246>.

Open Access This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

